Substitute Specification-
10/679,151

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PROJECTION EXPOSURE METHOD AND APPARATUS WITH LUMINOUS FLUX DISTRIBUTION

[0001] This is a Continuation of Application No. 08/423,457 filed April 19, 1995, which in turn is a divisional of Application No. 08/376,676, filed January 20, 1995, which is a continuation of Application No. 08/122,318, filed September 17, 1993 (now abandoned), which is a continuation of Application No. 07/791,138, filed November 13, 1991 (now abandoned). In addition, Application No. 08/376,676 also is a Continuation-in-Part of Application No. 08/257,956, filed June 10, 1994 (now U.S. Patent No. 5,638,211), which is a continuation of Application No. 08/101,674, filed August 4, 1993 (now abandoned), which is a continuation of Application No. 07/847,030 (now abandoned), which is the U.S. National Stage of International Application No. PCT/JP91/01103, filed August 19, 1991. The entire disclosure of the prior applications is hereby incorporated by reference herein in their entireties.

BACKGROUND

[0002] The present invention is directed generally to an exposure method and an exposure apparatus, and more particularly, to a projection exposure method and a projection exposure apparatus which are employed in a lithography process for liquid crystal elements and semiconductor memory cells having regular hyperfine patterns.

[0003] A method of transferring mask patterns on a substrate typically by the photolithography method is adopted in manufacturing semiconductor memories and liquid crystal elements. In this case, the illumination light such as ultra-violet rays for exposure strikes on the substrate having its surface formed with a photosensitive resist layer through a mask formed with the mask patterns. The mask patterns are thereby photo-transferred on the substrate.

[0004] The typical hyperfine mask patterns of the semiconductor memory and the liquid crystal element can be conceived as regular grating patterns arrayed vertically or horizontally at equal spacings. Formed, in other words, in the densest pattern region in this type of mask patterns are the grating patterns in which equally-spaced transparent lines and opaque lines, formable on the substrate, for attaining the minimum line width are arrayed alternately in X and/or Y directions. On the other hand, the patterns having a relatively moderate degree of fineness are formed in other regions. In any case, the oblique patterns are exceptional.